WE CLAIM:

1. An isolated heterodimeric receptor, which receptor comprises an opioid receptor subunit and a second G-protein coupled receptor (GPCR) subunit, wherein both receptor subunits are expressed endogenously in the same type of cell.

2. The heterodimeric receptor of claim 1, wherein the second receptor is an opioid receptor that is distinct from the first opioid receptor.

3. The heterodimeric receptor of claim 1, wherein the second receptor is a dopamine receptor.

4. The heterodimeric receptor of claim 1, wherein the second receptor is an adrenergic receptor.

5. The heterodimeric receptor of claim 1, wherein the second receptor is a chemokine receptor.

6. The heterodimeric receptor of claim 1, wherein the opioid receptor is a delta opioid receptor and the second receptor is selected from the group consisting of kappa opioid receptor, mu opioid receptor, D2 dopamine receptor, and β_2-adrenergic receptor.

7. The heterodimeric receptor of claim 1, wherein the opioid receptor is a kappa opioid receptor and the second receptor is selected from the group consisting of delta opioid receptor, D2 dopamine receptor, α_2-adrenergic receptor, β_2-adrenergic receptor, CCR5, and CXCR4.

8. The heterodimeric receptor of claim 1, wherein the opioid receptor is a mu opioid receptor and the second receptor is selected from the group consisting of delta opioid receptor and α_2-adrenergic receptor.

9. The heterodimeric receptor of claim 1, wherein the opioid receptor is a fusion protein comprising a sequence of a functional opioid receptor protein and a tag sequence.

10. The heterodimeric receptor of claim 1, wherein the second receptor is a fusion protein comprising a sequence of a functional second receptor protein and a tag sequence.

11. A recombinant host cell that expresses a functional heterodimeric receptor, which receptor comprises an opioid receptor subunit expressed from an expression vector introduced into the host cell, and a second G-protein coupled receptor (GPCR) subunit expressed from an expression vector introduced into the host cell, wherein both receptor subunits are expressed endogenously in the same type of cell.

12. The host cell of claim 11, wherein the second receptor is a different opioid receptor or a covalently associated opioid receptor.

13. The host cell of claim 11, wherein the second receptor is a dopamine receptor.

14. The host cell of claim 11, wherein the second receptor is an adrenergic receptor.

15. The host cell of claim 11, wherein the second receptor is a chemokine receptor.

16. The host cell of claim 11, wherein the opioid receptor is a delta opioid receptor and the second receptor is selected from the group consisting of kappa opioid receptor, mu opioid receptor, D2 dopamine receptor, and β_2-adrenergic receptor.

17. The host cell of claim 11, wherein the opioid receptor is a kappa opioid receptor and the second receptor is selected from the group consisting of delta opioid receptor, D2 dopamine receptor, α_2-adrenergic receptor, β_2-adrenergic receptor, CCR5, and CXCR4.

18. The host cell of claim 11, wherein the opioid receptor is a mu opioid receptor and the second receptor is selected from the group consisting of delta opioid receptor and α_2-adrenergic receptor.

19. A method of screening for a compound that modulates a property of a heterodimeric receptor, which receptor comprises an opioid receptor subunit and a second G-protein coupled receptor (GPCR) subunit, wherein both receptor subunits are expressed endogenously in the same type of cell, which method comprises observing a change in a property of the heterodimeric receptor contacted with a candidate compound.

20. The method according to claim 19, wherein the heterodimeric receptor property is trafficking of the heterodimeric receptor.

21. The method according to claim 19, wherein the heterodimeric receptor property is binding affinity for a ligand.

22. The method according to claim 19, wherein the heterodimeric receptor property is activation of a signal transduction pathway.

23. The method according to claim 22, wherein the signal transduction pathway is selected from the group consisting of cAMP production and MAPK phosphorylation.

24. A bispecific, bivalent compound comprising an opioid receptor ligand bound to a second G-protein coupled receptor ligand, wherein the second receptor is expressed endogenously in a type of cell that endogenously expresses the opioid receptor.

25. The compound of claim 24, wherein both ligands are agonists.

26. The compound of claim 24, wherein both ligands are antagonists.

27. The compound of claim 24, wherein both ligands are kappa receptor ligands.

28. The compound of claim 24, wherein the opioid receptor ligand is a kappa receptor agonist and the second receptor ligand is a delta receptor agonist.

29. A pharmaceutical composition comprising synergistically effective amounts of a ligand of a delta opioid receptor and a ligand of a second receptor selected from the group consisting of kappa opioid receptor, mu opioid receptor, D2 dopamine receptor, and β_2-adrenergic receptor.

30. A pharmaceutical composition comprising synergistically effective amounts of a ligand of a kappa opioid receptor and a ligand of a second receptor selected from the group consisting of delta opioid receptor, D2 dopamine receptor, α_2-adrenergic receptor, β_2-adrenergic receptor, CCR5, and CXCR4.

31. A pharmaceutical composition comprising synergistically effective amounts of a ligand of a mu opioid receptor and a ligand of a second receptor selected from the group consisting of delta opioid receptor and α_2-adrenergic receptor.

32. A method of treating a disease or disorder selected from the group consisting of chronic pain, drug abuse, schizophrenia, depression, central reward pathway, HIV infection, cardiovascular disease, and hypertension, which method comprises administering a therapeutically effective dose of a compound of claim 24 or a pharmaceutical composition of claim 29, 30, or 31.